

CLAIMS***We Claim:***

1. A process for the reduction of boron trifluoride emissions from a crude PAO product stream, the process comprising:

(a) distilling a portion of the crude PAO product containing a boron trifluoride-organic catalyst at a temperature sufficient to cause the boron trifluoride-organic catalyst to dissociate to produce an overhead stream comprising uncomplexed boron trifluoride and an uncomplexed organic catalyst component,

(b) contacting the uncomplexed boron trifluoride and uncomplexed organic catalyst component in a condenser column having an internal structure that increases the recombination of the uncomplexed boron trifluoride and uncomplexed organic catalyst component to form a recycle boron trifluoride-organic catalyst, wherein the recycle boron trifluoride-organic catalyst is about 30 % greater in saturation than the recycle boron trifluoride-organic catalyst recovered in the absence of the internal structure.

2. The process according to Claim 1, wherein the internal structure comprises a structured packing material, baffles or a combination of a structured packing material and baffles.

3. The process according to Claim 2, wherein the internal structure comprises stainless steels, Monel, Hastelloy, nickel, titanium, plastic, ceramics or mixtures thereof.

4. The process according to Claim 1, wherein the loss of boron trifluoride ranged from about 25 % to about 50 % less than the process without the internal structure.

5. The process according to Claim 4, wherein the recycle boron trifluoride-organic catalyst is from about 52 mole% to about 100 mole% saturated.

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6. The process according to Claim 1, wherein the organic catalyst comprises an alcohol, an alkyl acetate, an alkyl carboxylic acid, an ether or mixtures thereof.
7. The process according to Claim 6, wherein the organic catalyst comprises butyl alcohol, butyl acetate, propanol, pentanol or mixtures thereof.
8. The process according to Claim 1, wherein crude PAO product is an oligomeric mixture formed from one or more linear alpha olefins, the linear alpha olefins having from about 6 to about 20 carbon atoms.
9. The process according to Claim 8, wherein the one or more linear alpha olefins have from about 8 to about 12 carbon atoms.
10. The process according to Claim 1, wherein the crude PAO in (a) further comprises a monomer of a linear alpha-olefin oligomerized to form the crude PAO product stream and the overhead stream further comprises the monomer; and wherein the contacting step (b) further comprises the monomer.
11. The process according to Claim 1 further comprising:
oligomerizing a linear alpha olefin feed mixture by contacting the linear alpha olefin with a mixture comprising fresh boron trifluoride-organic catalyst, recovered boron trifluoride-organic catalyst and boron trifluoride; to form an oligomerization reaction mixture comprising boron trifluoride, boron trifluoride-organic catalyst, unreacted alpha-olefin monomer and poly-alpha olefin oligomers; and
complexing the free boron trifluoride by reacting the free boron trifluoride with an organic constituent selected from the group consisting of alcohols, alkyl acetates, alkyl carboxylic acids, ethers and mixtures thereof.
12. The process according to Claim 11, further comprising the step of removing heat of formation of the boron trifluoride-organic catalyst by cooling a vapor-liquid mixture contacting the internal structure comprising the internal structure, wherein

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the internal structure comprises a structured packing material, baffles or a combination of a structured packing material and baffles.

13. The process according to Claim 11, further comprising separating the recycle boron trifluoride-organic catalyst from the monomer and/or a dimer olefin overheads of the distillation column.

14. The process according to Claim 13, wherein the separation comprises a phase separation.